THE

YOUNG MECHANIC.

VOL. I. MARCH, 1832. No. III.

OBSERVATIONS ON DRAWING INSTRUMENTS.

[Continued from page 23.]

IN our observations on instruments, we shall begin with those employed in drawing lines; and of these the first which comes under our notice is the black or red lead pencils. It is very material that the student should be so far acquainted as to select the best for his use. They should be of the purest lead, without the admixture of any hard or gritty particles. The hardness of the pencil should be adapted to the purpose for which it is used. For all kinds of mathematical drawing, when the lines are to be traced over afterwards with ink, they should be hard, of an even temper, and quite black, should always be kept cut to a very fine point by means of a knife, or what is much better, a fine file; should be able to preserve the sharpness, and at the same time, should mark with so little pressure that it will not penetrate or indent the paper. This is highly essential in the pencil, for if it require much exertion to erase the marks with the India rubber, the surface of the paper becomes rubbed up, and the filaments catching in the pen prevent it from drawing fine lines, or the color from laying smooth. Some pencils are made by reducing the lead to a very fine powder, and recomposing it by the aid of some gelatinous substance. By this means the impurities of the lead are separated, and sometimes very good pencils are produced, but these can never be brought to so fine a point as those made of the solid lead. Those made of the Cumberland lead are generally esteemed the best in England. Messrs. Brookman and Langdon of London, and Joseph Sewall of Liverpool, have invented processes for purifying the lead so as to produce pencils of any required temper. Cunningham's pencils, and Cowen's of New York, are the best manufactured in America. With respect to hardness, the makers distinguish them by the following marks:—Treble hard, hard in the highest degree, marked HHH. Double hard, for surveyors, etc. marked HH. Hard, for short hand etc. marked H. Medium, for drawing, writing,

etc. marked F. Hard black, for ditto, softer than F, marked H B. Black, for shading, etc. still softer, marked B. Deep black, for dark shading, softest, marked B B.—*Chalk.* Double, hard gray, marked H H C. Hard, black gray, marked H C. Soft, black, marked S. Double soft, intense black, S S.

All these marks are of a very superior kind, particularly the H H, which wear at the point so little, that it is scarcely necessary to cut them more than once or twice during the day. The point will frequently wear so as to draw a broad line. When this occurs it is better to sharpen it by the file than by the knife, as in the latter case we are very liable to break off a large portion of the lead, if we are not extremely careful. Some use for this purpose a piece of very fine glass or emery paper. The best pencils that the writer has ever used, are those made by Dobbs & Co. London. The student cannot be too careful in the selection of his pencils, for on them depend in a great measure the beauty and accuracy of his drawing.

ESSAY ON THE MECHANIC ARTS.

In considering the claims of arts and manufactures, the first inquiry which presents itsself to the christian or the philosopher, relates to their tendency to advance or retard the best interests of human society. The mechanic arts have been truly said to contribute to the general promotion of intellectual progress, by lessening manual labor, thus leaving the mind free to act.(1) But this is but a secondary benefit; they claim the attention of man as means of bringing into action the mental and physical powers of his nature. Nothing can be more obvious,than that peculiar adaptation in man's animal frame which makes it the organ of the mind. While the intellect conceives and the imagination portrays, it is for the hand to obey the will, and embody what before was only evident to the mental vision. It is well known that the first rudiments of mechanical philosophy were derived from nature. The wonderful adaptation of means to ends, and the evident marks of design exhibited in the works of creation, instructed and incited men's inventive faculties; and to this source we may justly ascribe the attainments made by the power of human art. But nature incites and improves, not only by the instruction conveyed in her laws and operations, but in the material she affords for the exercise of mind. It may be questioned whether nature has not been too much regarded as a means of improvement, in a general sense; whether man has not been too well satisfied in merely listening to her 'teachings,' and less anxious to apply her principles and bring into action her latent energies: in short, to make the laws and productions of nature the materials for the ardent and energetic exercise of the intellect.

It is evident that talent, among us, inclines, in its development, to literary and professional pursuits; and this can be reasonably accounted for from the fact that the great engine of civilized society, public opinion, has not in our community exerted an in-

fluence decidedly in favor of the mechanic arts as objects of general enterprize and intellectual research. This adverse tendency in the public mind may partly be attributed to the baneful effects which have arisen in England from the extensive introduction of manufacturing establishments. But it may be fairly doubted whether these effects must necessarily accrue in this country, differing as it does from the old world in its republican institutions and consequently in the tone of public sentiment. At least we may hope to profit by the experience of Great Britain, and escape those errors which have entailed upon her so much of poverty and suffering. There exists likewise a moral sentiment in this community wide enough in its influence, and deep enough in its foundation, to afford the happiest auguries of the ultimate and entire success of those establishments devoted to the culture of the mechanic arts.

It has been truly observed, that there exists in this country 'a foolish disdain of bodily labor and dexterity.' This prejudice has done much to retard the progress of the useful arts among us, by leading the scientific either to devote their talents wholly to literary and professional pursuits, or to rest satisfied with simply exhibiting them theoretically. But when it is considered that a scientific knowledge of any art secures to an individual independence, by affording him a resort when other resources fail, and when in addition we remember the uncertainty attending the possession of property and the prosperous prosecution of commerce, we cannot but wonder that the arts, both useful and ornamental, do not more generally attract the labors of the scientific and enterprizing. 'If, therefore, it is important to the country that abstract principles should be applied to practical use, it is clear that it is also important that encouragement should be held out to the few who are capable of adding to the number of those truths on which such applications are founded.'(2) It is not to be supposed that the great number of young men who adopt professional pursuits, do so from any peculiar adaptation in their own powers and casts of mind for the particular profession they follow. It is evident, that in frequent instances the governing motives are far less judicious, and among these we may safely rank the leaning of public opinion towards literary pursuits. True, notwithstanding this, we can boast of those who have left enduring monuments in their inventions; but we may justly attribute the great encouragement given to the best and the noblest of American artisans to the early period in which he lived, and the great respect with which works of utility were then regarded.(3) Without doubt literary and professional pursuits have a high claim upon the encouragement and respect of our country, and happy it is that this claim has been recognized. Still, in the predominant encouragement which has been given to these employments, the great object has been to aid and develope talent—an object as noble as it is patriotic, and one which should not be forgotten with regard to scientific pursuits. 'It is for want of the little that human means must add to the wonderful capacity of improvement born in man, that by far the greatest part of the intellect innate in our race perishes undeveloped and unknown.'(4)

The principal reasons which have been assigned for the slow progress of the useful arts, are drawn from the wide separation which has been made between science and art, and the fact that many of the greatest inventions have resulted from accident rather than superior knowledge.(5) These considerations have tended to give to these pursuits the character of unintellectual employments. Whereas they require and call forth the best powers of the mind, and fail to secure the attention of the wise and talented only because they have been too much regarded as subjects of mere mechanical labor. 'Had Watt been an ignorant man, the model of a steam engine might have been placed in his hands, several times, for repair, without any discovery ensuing.' Scientific knowledge is absolutely essential to the progress of the mechanic arts.

The great object of study and mental effort, is the acquisition of original thought; and this we call invention, whether it is exhibited in the production of new ideas or practically set forth in a machine. Invention or the acquisition of originality, is the noblest effort of the human mind. It is thus, indeed, that the intellect manifests its native independence and energy, by leaving the beaten track, soaring to the conception of new truth, and adding another to the monuments of human talent and the means of human improvement. And it is when contemplating these results that we feel that the 'soul in all its higher actions, in original thought and in the creations of genius, has a character of infinity.' MARCELLUS.

NOTES.

(1) 'In the first ages of the world, when mechanism was not yet known, and human hands were the only instruments, the mind scarcely exhibited even the feeblest manifestations of its power. And the reason is obvious. As physical wants could only be supplied by the slow and tedious processes of hand work, every one's attention was thereby completely absorbed. By degrees, however, the first rudiments of mechanism made their appearance, and effected some simple abbreviations. One could now supply the wants of two, or each could supply his own in half the time previously required. And now it was that mind began to develope its energies and assert its empire over all other things.'

Defence of Mechanical Philosophy.—N. A. Review, No. 72, p. 125.

(2) Remarks on the decline of science in England, by Charles Babbage, Esq.

(3) This remark admits of qualification. Dr. Franklin undoubtedly owed much of the encouragement which was bestowed upon his mechanical inventions to the brilliant success which attended his philosophical researches. His character as a scientific man gave to his labors as an artisan a just reputation.

(4) In this connection it does not seem inappropriate to notice the amount of encouragement afforded by our patent law. The following sketch of its character and operation is derived from a few brief notes taken at the delivery of two lectures in March, 1831, before the Boston Mechanic's Institution, by Hon. William Sullivan.

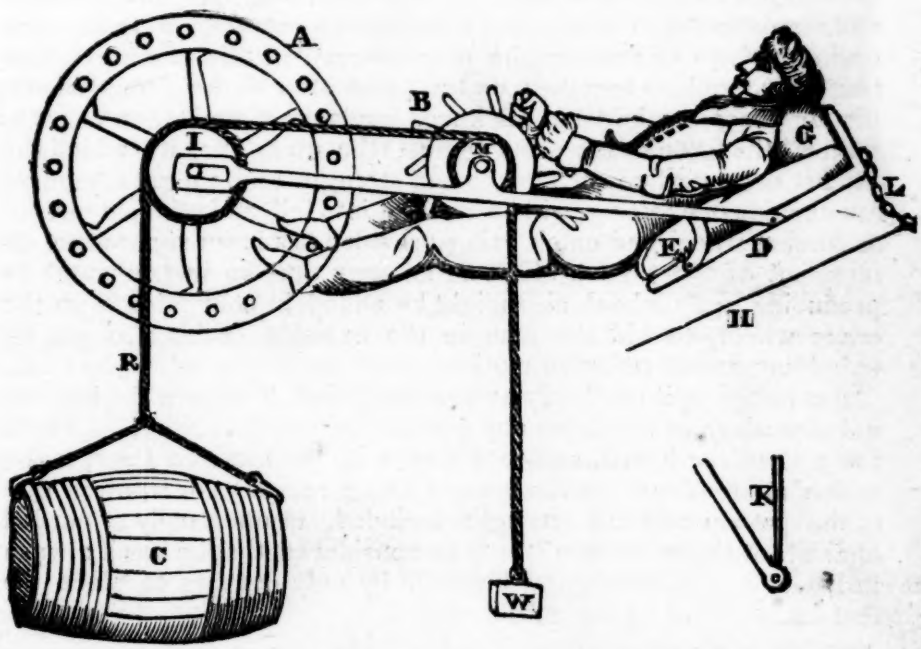
Our patent law was derived from the English patent law, enacted in the reign of James I. 1633. The law is very defective, inasmuch as it does not recognize the right of property as the principle on which it allows patents; but rather as a favor conferred by the government upon the patentee. Whereas thoughts or the result of thoughts are as much property as the product of manual labor, and as such the proprietor has a just claim upon the government for protection. But the great defect which exists in the law is, that the inventor, when he obtains a patent, (for which he pays $30) is by no means secure in the undisturbed possession of his privilege. For he is continually liable, in case of an action, to

lose his patent through any trifling inadvertency in the phraseology of his specification, or upon the discovery that any part of his machine, however insignificant, was previously invented, unless he has specified it. It is not to be supposed that the means of ascertaining this important fact are accessible to every one, or even the majority of individuals.

The only expences of the patent office are for the room and the salary of one officer, which if deducted from the income, would probably leave $10,000. With this, and if necessary, an additional sum, Mr. Sullivan proposed that the government should maintain a board of commissioners, who should sit at Washington, and not only attend to the usual duty, but also give the patentee all the information and aid in their power. Mr. Sullivan also thought that in case of suits the patentee should not be liable to lose the whole of his privilege, but only a proportionate part, as in other cases.

When it is remembered that the patent law has for its specific object, the encouragement of native industry and talent, and the great influence it exerts upon the progress of the useful arts, the importance of the above suggestions must be apparent to every reasonable mind.

(5) The art of printing is said to have originated from suggestions awakened by the view of several impressions made by some figures cut from bark for the amusement of a child. A shower having moistened them, an impression was left upon the paper in which they were enveloped.



PROPOSED APPLICATION OF HUMAN STRENGTH TO THE GREATEST POSSIBLE ADVANTAGE.

In the figure above sketched, is shown the whole strength of a man's legs, his arms, and the weight of his body, all concurring to raise the weight, C. Thus his legs, by means of his feet pressing against the rounds of the crane-wheel, A, exert a horizontal force in one given direction; his arms, in pulling at the handles of the lever wheel, B, a similar one, but in an opposite track; and that there is a concurrence of the weight in giving added effect to these motions, on the principle of a lever application, is manifest.

The rope, R, making one or two turns round the axle I, and the same at M, thence descends to W, which is a small weight hung on merely to detain the rope from sliding round the axle by straining it tight. In place of this arrangement, there may be substituted an endless chain, passing over the two wheels, A and B. D is a board, which, in conjunction with F, sustains the man in the inclined position he occupies, ultimately determining the pressure of his weight *in excess* against or upon the steps of the crane-wheel, F, being moveable on the axis at I. There is a pressure felt also upon his back and shoulders; to relieve him from the inconvenience attending which, the mattrass, E, and cushion, G, are provided, which also serve to hinder him, particularly the latter, from sliding upward, as he would otherwise have a tendency to do.

If at any time his arm become fatigued with the labor of *pulling* at the handles of the lever wheel, B, he can conveniently give them relief by changing their mode of action to that of *pushing*, as against a cross-bar placed between two supports [see fig. K] the doing which will give additional effectiveness to his weight, by depressing him lower down—a movement that will, of course, be determined to the crane wheel by an added impulse to turn it round; and on occasion of his being required to put forth a more than ordinary share of exertion, he may proceed in this manner. Setting his feet close together on the same step of the crane wheel, his legs kept straight and his knees firmly knit, he is then to press with all the force of his arms against the cross-bar, by which the utmost degree of power that human strength and weight combined are capable of exerting, will be brought into full and efficient action. A ratchet wheel and catch being provided to render secure the attainment of every such effect as he may thus be instrumental in producing, a fly wheel also might be added in connexion with the crane wheel, to aid the man in the exertion of his strength by upholding a uniformity of motion.

In conclusion, it need only be observed, that, to secure the individual at work from receiving any possible injury, the chain L, is set to the end of the board, and to a staple in the inclined floor, H, by which all tendency in the weight being raised to overpower that of the person and his strength included, is effectually guarded against; at the same time it is to be considered, that he has it always in his power to disengage himself, by only ceasing to place his feet on the steps of the crane wheel.

STRENGTH OF MUSCLES.

The animal frame constitutes an assemblage of levers. Its motions are performed by means of powers applied to these several levers, which powers are acted upon by means of nerves, which are influenced by means of the will; but by what manner this latter is performed we are entirely ignorant. For it is difficult for us to conceive how an *immaterial substance* can act upon matter; the fact, however, is indisputable.

A muscle is a bundle of flesh, or it is the flesh, in common language. The fleshy fibres compose the body of the muscle, and the tendinous fibres the extremities. Some muscles are long and round. Some have spiral, and some have straight fibres. Some are double, having a tendon running through the body from end to end. Some have two or more tendinous branches running through with various rows, and orders of fibres. All these, and several other orders of fibres are essentially requisite for the respective offices they are destined to perform in the animal system.

One design of the muscles is to give to the body that varied and beautiful form observable over all its surface, but their principal design is to serve the organs of motion. They are inserted by strong tendinous extremities into the different bones, and by their contraction and distention, give rise to all the movements of the body. The muscles, therefore, may be considered as so many cords attached to the bone, and in some cases, in order to multiply power, passing over pullies. The Author of nature has fixed them according to the most perfect principles of mechanics, so as to produce the fittest motions in parts the movements of which they are intended to effect.

One of the most wonderful properties of the muscles is the extraordinary force they exert, although they are composed of such slender threads or fibres. Philosophers and physiologists are not agreed with regard to the strength of muscles in different animals, especially in man. Some have made the force prodigious, while others have diminished it to that of a few pounds and even ounces. The truth may possibly lie between. I shall give a few instances of their calculations on the prodigious force in this communication, and may perhaps hereafter give other remarks. The calculation is amusing and interesting, and may direct the attention of the young mechanic to the subject of *animal statics*, as it is a subject intimately connected with Natural Philosophy.

When a man lifts up with his teeth a weight of 200 pounds by means of a rope fastened to the jaw teeth, the muscles named *Temporal* and *Masseter*, with which people chew, and which perform this work, exert a force of above 15,000 pounds weight ! If any one, hanging his arm directly downwards, lifts a weight of 20 pounds with the third or last joint of the thumb, the muscle which bends the thumb and bears that weight, exerts a force equal to 3000 pounds weight. When a man, standing upon his feet, leaps or springs upward to the height of two feet, if the weight of such a man be 150 pounds, the muscles employed in that action will exert a force 2000 times greater, that is, 300,000 pounds!

The heart at each pulsation or contraction, by which it protrudes the blood out of the arteries into the veins, exerts a force of above 100,000 pounds! The power with which the stomach digests its food, in conjunction with the assistance it receives from auxiliary muscles is, according to Borelli, equal to 261,186 pounds. There have been reckoned in the human body, about 446 muscles, which have been dissected and distinctly described, every one of which is essential to the performance of some one motion or other, which

contributes to our enjoyment: and in most instances a great number of them is required to perform their different functions at the same time. It has been calculated that about 100 muscles are employed every time we breathe. J. R. C.

INDIA RUBBER.

MESSRS. EDITORS:—As the nature and application of Caoutchouc, (or India rubber) to different purposes, is but little known, I send you the following communication upon the subject, in hopes it may be useful to some of your readers. India rubber is the common name of this substance, but in chemistry it is called caoutchouc. It is the concrete juice of the *Hœvea Caoutchouc* and *Jathropa Elastica*, natives of South America; and of the *Ficus Indicus* and *Artocarpus Integrifolia*, which grow in the East Indies. It is procured by making an incision in the tree, from which it flows into a kind of bowl, made of clay, and attached to the tree when moist. From this, it is taken and formed into the desired shape with moulds, either by dipping them in or brushing them over with the gum while in its fluid state, which in a short time becomes a soft yielding solid, very tenacious, and remarkable for its elasticity. It is made into shoes, tubes and bags, for chemists, toys for children, and various articles both useful and amusing. As the nature of India rubber is such that it cannot be kept in a fluid state for exportation, and for this reason, cannot be applied to so many useful purposes, many experiments were tried to obviate this difficulty, which resulted in obtaining this great desideratum. This is done by the naptha* from coal tar, which will dissolve it without altering the properties of the gum. This solution can be conveniently used for making elastic tubes, but is more useful for covering cloth or leather, to make it impervious to the weather. This property of coal naptha was discovered by Mr. Syme. An easy method to make tubes, is to take sheet India rubber, about a tenth of an inch in thickness, an inch in width, and of any length, which must be cut with a pair of clean and sharp scissors, that the edges may be left with clean surfaces; then wind it spirally round a glass tube, bringing the cut edges in contact with each other, which is best done by applying a thumb nail upon each side of the section. When firmly pressed together while warm, the adhesion is such, that it will tear elsewhere as readily as at the junction. To prevent it from sticking to the glass, put a little flour over the inner surface of the gum, taking care that none of the flour gets upon the edges, which will prevent them from sticking. This process may be used with advantage in the repairing

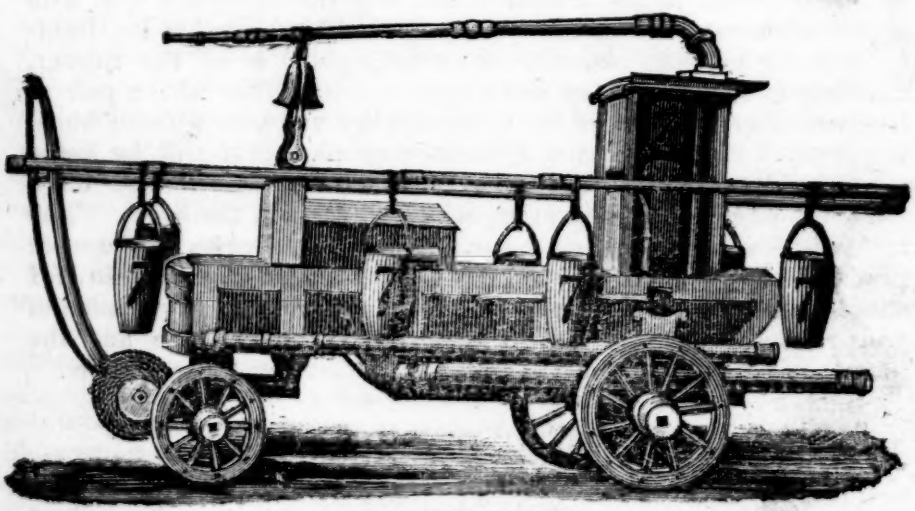
* This substance is one of the products of the decomposition of coal. It is distilled from coal tar, at a very gentle heat, when naptha, from its great volatility, passes over and must be condensed in the mattrass. In distilling this substance, after the naptha has passed over another substance called napthaline, will condense in the neck of the retort, as a white, crystalline solid. This must not be used, but only the naptha in the mattrass, which is a dark oily liquid. EDS.

of India rubber shoes. In this case it is found to be useful to put a little of the gum, dissolved in spirits of turpentine, between the edges before joining them. It can be done, however, by merely using the clean edges and heat, as in making tubes. To make thin or sheet India rubber, I have heard of two methods; one is by gradually heating it until it becomes soft enough to be blown out as thin as wanted, the other, instead of heating it, is to soak it for ten or twelve hours in sulphuric ether, and blow it out in the same manner as when softened by heat. The common India rubber bags are generally used, as being the most convenient for this purpose. If this be done with ether, the bag, after being filled with air, should be left for the ether to evaporate, which will be in a few hours, when it will be found to have lost none of its elasticity. It may be observed, that in all experiments with Indian rubber, those parts which are to be kept separate should have flour between them; and in making the bags, it is necessary to blow flour upon the inside, to prevent their sticking. The following method I have used with success, in making small bags to be used instead of bladders, for philosophical purposes, (which are not easily kept from becoming dry and cracking.) Take a piece of sheet India rubber, double it, and cut the bag piece out with a pair of clean scissors, when the edges will be found to be slightly adhering to each other; then by taking a strip of the rubber, doubling it over the seam, and pinching it together with a pair of tongs or pliers, heated as hot as the rubber will bear without burning, (which should be tried upon another piece,) it will be found when cold to be as strong as any other part, and I have often burst the bag, by blowing in it, without starting the seam. The methods described in this communication I believe to be the most practicable and easy of those which are recommended: but if I should labor under any mistakes in this particular, I hope some of your readers will correct them, both for my satisfaction and the benefit of others. J. M. W.

SCIENTIFIC DEPENDENCE.

Slowly did even the art of printing progress, after the desideratum had become manifest. So imperceptible were its earliest improvements, that history has not been able to settle the claim of the first inventor. If Guttemburg was that man, he certainly did not perfect his discovery without the aid of Faust and others. Nor would Faust probably have originated it without Guttemburg. The discovery of gunpowder was accidental, and it was half a century before its use and application were understood. Nor had the first inventors any conception of its future uses. The great Bacon, the morning star of modern science, could not have appeared in a state of society fifty years earlier. Bacon was followed by Kepler, and Newton, and Locke, who, without the light which he and others had thrown upon the paths of knowledge, could never have appeared in the characters which they sustained. Nor should we ever have heard of Stuart's or Brown's philosophy

of the mind, if Locke, and Berkely, and Hartely, had not preceded them. Nor of Franklin, or Herschel, or La Place, but for those who had opened the way for their discoveries. And what would now be the state of modern chemistry, if Priestly, and Black, and Lavoisier, had never lived? Would Fulton have invented the steam boat, if Watt had not perfected the engine itself? Or who, without Arkwright, would have brought the improved methods of spinning cotton to their present state? Such is the structure of the human mind, and such its necessary dependence, one upon another, that man in a solitary state, or in one so rude as to be without the means of retaining past experience, or of handing the present down to others who are to follow him, can attain little more than to live upon the face of the earth, among its wild and wandering inhabitants. The whole history of the world, so far as we have it, proves the fact; and carries, upon its very face, the reason why so many generations of men have followed each other with so little advancement. They wanted the means of preserving and reciprocating their improvements, as well as the stimulus to make them.



FIRE ENGINES.

Fire engines were invented about the year 1663. A great number of different forms and arrangements of the working parts has been made, acting on the same general principles, the compression of air to produce a continued stream. The perspective view at the head of this article, is one of Mr. Newsham's fire engines ready for working. In this engine there are two cylinders connected with an air vessel by means of brass channels, generally known as the water ways; under each cylinder is a valve, as also at the end of the channel in the air vessel. The piston is made solid to fit tight in the cylinders, thus acting both as a sucking and forcing pump. The pistons are worked by iron chains, and receives their motions by means of two circular sectors

of iron, secured together and fixed upon proper squares of the middle horizontal bar. The shape of the piston rods, and the rise and situation of the chains that give them motion, are so arranged that the vertical axis of the piston is in the middle of the breadth of the perpendicular beam, part of the chains and the upper part of the piston rod taken together. The principles on which this engine acts to produce a continued stream are obvious. The water being driven into the air vessel by the alternate movement of the pistons, will compress the air contained in it, and proportionally increase its spring. The force of the air's spring will be always inversely as the space which it possesses. Were it not for this resistance of the air increasing in a greater ratio than the velocity of the water, by condensing a large quantity of air in a small space, the water could be forced to any given distance, but it is found that when projected with great velocity beyond a certain distance, the resistance of the air will disperse and separate the stream into small particles. The advantage gained by it is, that the reaction of the condensed air serves to keep up a constant pressure on the water in the air vessel, and sustains the stream perfect at the moment of the return stroke.

These engines are very convenient; the breaks or levers by which the engine is worked, being stationary, it is easily put in operation. The suction hose is at the end of the engine, so that it can easily be used on a wharf or the banks of rivers, in drawing and throwing the water. When these engines were first used, treadles on which men stood upon the engine were thought requisite, in connection with the breaks, as the moving power, but it has been found by experience that they are of no use, as sufficient power can be obtained by the breaks alone for all useful purposes.

W.

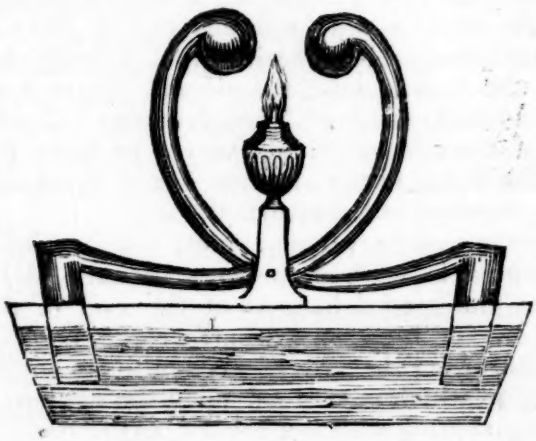
NEW INVENTION.

Messrs. Editors—I send you the account of an invention, said to be new, with some remarks thereon.

There is a model of an ingenious engine at the Mansion House, by which a mill, or other machinery may be put in motion, by a new application of heat and cold. A beam is balanced, on each end of which is a copper vessel,communicating with each other by a tube; one of these rests over a fire which heats the water and rarifies the air, whose expansion forces the water through the tube to the vessel at the other end of the beam or lever, which is immediately brought down by its weight. The vessel, now raised beyond the influence of the fire, has its interior so nearly approaching a vacuum that the atmospheric air of the other vessel forces the water back to its former place, thus producing an alternate motion, which furnishes the power. A wheel is attached to the model, which is kept in motion by water which is returned into the reservoir, from whence it flowed, without waste. It is an ingenious invention, and from the simplicity of the machinery, if it succeeds on a large scale, must, in a great measure, supersede steam engines.

The inventor, Mr. Prouty, of Augusta, is on his way to Washington and New York, in order to deposit a model in the Patent Office, and to construct a machine of about thirty horse power.—*Savannah Georgian.*

That this invention is ingenious, I admit ; but that it is new, or useful (for the purpose stated above,) I think is not the case. The same principle has been applied before in various ways and for different purposes. Mr. Clegg has contrived a *Gas-metre* on precisely the same plan, and I have set several models to work of various forms on similar principles. The annexed figure is selected from among a number of drawings of such machines; some of them swing like a pendulum.



In this machine there are two copper balls, each having a tube open at the lower end, which terminates in a vessel of water. When one ball is placed over the lamp, some of the air which it contains is expelled, and escapes at the open end, and rises through the water. If the other ball be now brought over the lamp, the air will be rarified in that also, while a vacuum is forming in the first. At the same time the water rises in the tube above the level of the water in the vessel. This will now preponderate and bring the first ball over the lamp again ; the water will now be driven out of its tube by expanding the air, while the other tube is filling with water to be brought down in its turn, and so on alternately. This is the proper motion for working a pump, but the operation is too slow to be of any service; it will not do to heat and cool the balls at each stroke. In the American Mechanics Magazine there is a plan of an engine with a ball at each end of a beam; it has a separate steam boiler: the motion of the beam operates on the cock, to change the steam from one ball to the other. This I think is much better than Mr. Prouty's Machine or mine.

HYDRO.

METHOD TO OBTAIN WATER.

MESSRS. EDITORS—The other day I called into the workshop of a young and ingenious mechanic of this city to inspect some of his inventions. Among his many contrivances I noticed one which might be useful to mechanics in general. His room being in the upper story, he was desirous to obtain water to supply his forge and for other purposes. With this view he inserted a leaden pipe in a proper manner into the spout of the building, and continued it downward through one of the upper panes of glass in the window to a hogshead in the room, which stood upon one end, the upper head being out. In the end of this pipe he fixed a common composition cock, the handle of which turned down horizontally, instead of vertically. In this handle he attached the end of a rod of iron about 15 inches long, which had on its other end a hollow sphere of tin or copper, made air tight, and which floated on the water. When it rains the water runs from the spout, through the pipe into the hogshead, and when it arrives at a certain height, the ball rising with the water closes the cock, and shuts it off from further entrance. His supply is at all times sufficient, and he is thus by this simple method saved a great deal of trouble and time.

OBSERVER.

SAFETY PIPE FOR STEAM BOILERS.

Mr. De Witt recently presented to the Albany Institute a plan to prevent the explosion of steam boilers. He recommends a pipe which is to extend from a few inches below the surface of the water in the boiler, to a height of two feet for every pound of pressure; that is, if the engine is working with 15 pounds to the square inch, the pipe must be 30 feet high. When the steam gets above this pressure the water will flow over the top of the pipe, and will also serve to give notice if the water is below the end of this pipe.

The same plan was pointed out in a letter to the editor of the London Times; the account is before me in a Boston paper dated May 19th, 1827, as follows; 'It appears to us far more efficacious than any we ever saw or hoped to see; the pressure of steam is measured by the rise of the water of the boiler in a pipe, inserted into the top of the boiler and immersed in the water, in the same manner as the mercury in the barometer gives the pressure of the atmosphere.' It goes on to state that the pipe must be two feet high for every pound of pressure, and concludes with nearly the same observations as above. This plan certainly deserves a fair trial. I would observe that the height stated is not enough. It requires nearly 28 inches of fresh water to support one pound of pressure. The precise height may be found by multiplying the pressure by 2·304. If the pressure be 15 pounds the height will be 34·56 feet.

WATT.

MECHANICS' INSTITUTION.

In one of the cities of the British empire, a mechanics' institution was established, a few years ago, when Brougham and Birkbeck, and many enlightened and liberal men, were suggesting and stimulating the popular instruction of the working classes. To this institution a talented and efficient lecturer was procured, whose engaging and attractive manner soon gained him a high reputation. It was a delightful scene to walk in, on a winter's evening, and see such a crowd of young men, and among them many of the middle aged and old, who, instead of spending their leisure time in the roar and dissipation of a tap-room, were listening with breathless attention to the reasonings of the lecturer, and viewing his experiments with lynx-eyed curiosity. Many of them belonged to trades which could easily furnish them with an excuse for non-attendance, on the score of fatigue and want of cleanliness. But these very classes seemed to be among the most indefatigable of the audience. No storm could frighten, no distance detain—there they were, with clean washed faces, and aprons neatly tucked up, and almost every one with a book for the purpose of exchanging at the library. The benevolent mind, in viewing such a scene would naturally spring forward to the hour, when the wilds of America, the deserts of Africa, and the lone isles of the Pacific, would boast their Broughams and their mechanic institutes—and every shade of humanity, from the blooming white and red, to the deep glossy black, know no distinction but *mind*—no superiority but *intellect.*—*Dublin pap.*

MODE OF PRESERVING BEER FROM SOURING.

A copper ball, of about five inches in diameter, strong enough to bear a considerable pressure, has a cock attached, with a wood screw cut on it, which screws into the hole in the top of the cask, into which the vent-peg is usually put. Previous to attaching this ball to the cask, carbonic acid is injected into it to a pressure of about 50 pounds to the inch (this is easily done by means of a condenser of small bore:) it is then to be screwed to the cask. When beer is to be drawn, the cock in the bottom of the cask is opened, and when the beer ceases to run from it the other cock is opened, communicating with the ball, and the carbonic acid gas allowed to press upon the liquid in the cask, which acts much more forcibly than by permitting the atmospheric air to rush in, as has been usually done. The chief advantages to be gained by Mr. Mallett's contrivance, are, first, the perfect exclusion of the external air; secondly, portability; and thirdly, the convenience of being able to apply a considerable pressure to impregnate the beer with the gas, as in the manufacture of soda-water.

The whole apparatus may be constructed for the same sum as is usually paid for the patent vent-pegs; and if it did cost something additional, it would be fully repaid in the beer keeping so much longer.—*London Mech. Mag.*

ANSWERS.

MESSRS. EDITORS—I was pleased to observe in your last number a question relating to a more humane method for killing neat cattle, than the one in common practice. In many places in other countries,* and I know not but in some parts of this, a much more humane method is employed. It is as follows: At that part of the skull of the animal that joins his neck, there is a circular hole, through which the spinal marrow issues from the brain, passing down into the back bone. Extensive injury to the spinal marrow at this spot, where it leaves the skull, is instant death. Now if a pointed instrument, having a broad blade, be laid flat against the base or back of the skull, the point of course directed downwards, it may, by a blow from a mallet, or a vigorous thrust, completely sever the spinal marrow at the point above indicated, and the animal will die instantly.

Let a butcher examine this hole in the base of an ox skull that may be laying about. Remember that the knife must pass between the wall of the skull and the first bone of the neck, (and therefore the wall of the skull will guide the knife;) let him try his skill first a few times on a dead animal, so as to learn the direction, the degree of force necessary, &c. and he will find it a much more convenient practice than the barbarous one so generally used at present.

MESSRS. EDITORS—Information is required by Philo, in your last number, for the cause why horses were killed by lightning, while the persons in the carriages drawn by them remained unhurt. I should attribute their death to the conducting power of the steam or vapor, by which their bodies are surrounded during their extraordinary labor in the heat of summer. Vapor is a good conductor of electricity, and it ascends considerable distance above the animal producing it. Animal bodies, although good conductors of electricity, are much effected, and if in sufficient quantity, it causes their death.

A PRACTICAL ELECTRICIAN.

MESSRS. EDITORS—In answer to the question in the last number of your useful Magazine, relating to the seamen's frugal meal, I would say, that the 6 cents which D paid should be divided among A, B and C in proportion to the number of biscuits each had. The whole number of biscuits being 12, and A having had 3 of them should have 3-12ths of 6 cents, B 4-12ths, and C 5-12ths; consequently A's share will be 1 1-2, B's 2, and C's 2 1-2 cents. T.

If the three men had furnished goods for sale as in a mercantile adventure, the answer of T. would have been right. But as we understand the question, the answer of M. is correct. EDS.

MESSRS. EDITORS—The question, how should the money be divided between the 3 seamen, A, B and C, I would answer in this way:—B should receive 2 and C 4 cents. The reason of this decision is, the whole number of biscuits is 12, which divided equally between the 4 seamen would allow 3 to each. As A had but 3, he only had his share, while B had 1 and C 2 to spare, which made the share of D. Thus it will be seen that as A gave nothing he could receive nothing, and the money must be divided between B and C, B to receive one-third and C two-thirds. M.

* This practice prevails in Portugal. Lord Somerville caused a person to be instructed in the art.—See *Dom. Enc.* vol. 3, p. 252. EDS.

QUESTIONS.

MESSRS. EDITORS—A friend informed me the other day that air has been condensed into the ball of an air gun, so that its weight was increased one ounce and a half by the operation.

Query. What pressure on the square inch did the ball sustain, supposing its internal diameter to be four inches, the weight of a cubic foot of air one ounce and two-tenths, and the pressure of the atmosphere fifteen pounds on the square inch? ANVIL.

SUPPOSE a column of water be discharged through a gate with a velocity of 16 feet per second, and that that velocity be diminished one half by the resistance of the water wheel, what part of the power is expended, and what part remains in the water unexpended? F.

A PERSON bought a certain number of calves for 80 dollars, and if he had bought 4 more for the same sum, they would have cost a dollar a piece less. Required the number of calves, price of each, and mode of solution.

MESSRS. EDITORS—Permit me through the medium of the Young Mechanic, to inquire of the many masons or brick layers of our city, why they do not contrive some more elegant method to prevent chimneys from smoking, than those unsightly piles of bricks which are so generally added to their tops. G. R.

How many different ways can the twenty-six letters of the alphabet be placed, using the whole each time? ☞

TO CORRESPONDENTS.

THE abstract of the proceedings of the late meeting of the New England Association of Farmers, Mechanics and other Workingmen, promised in our last, is deferred in order to notice the auxiliary to said Association now forming in this city, at the same time.

'Table of the Velocity for Boring and Turning Cast Iron,' 'Railways and Carriages,' 'Theory and Practice,' a Question respecting the Atmosphere, and an article on the Apprentice Question, are received.

ERRATUM.—In the last number, 23d page, and 14th line from the top, for '*inch* point,' read, '*ink* point.'